

## WIRELESS ELEVATOR FIXTURES INTEGRAL WITH DOOR FRAME

### Technical Field

This invention relates to the elimination of building wiring for the purpose of powering elevator hall fixtures including call button lights, directional lanterns, and floor indicators, by having the hall fixtures mounted integrally within the hallway door frame, with all of the necessary apparatus prewired, including controls, wireless communication apparatus, and power storage devices; power is supplied to the hall fixtures by either contacts which draw power from the elevator while it is at the landing, or inductive coupling of power from the elevator while it is at the landing, or power generated by movement of the hoistway door when the elevator is at the landing.

### Background Art

Elevator systems have hallway fixtures at each floor, including directional lanterns, hall call buttons, and in some cases, elevator position indicators. Traditionally, each hallway fixture on every floor was powered by means of wires run through the hoistway, with additional wires to provide signal communication between the floor and the controller, which has typically been located at the top of the hoistway in a machine room. To reduce the amount of wiring, modern systems use serial communication buses which typically may require two wires for communication and two for power, one bus each for the lanterns and call buttons. The wiring requires significant installation time in new buildings, and makes modernization of existing elevators extremely difficult. Further, work in the hoistway is dangerous and should be avoided if possible.

The communication aspect of hall fixtures has been rendered wireless by means of radio frequency (or other) wireless communications. However, power is still required to be provided by wires, which must be specifically installed in the building during initial construction of an elevator system, or as a consequence of modernization.

**Disclosure of Invention**

Objects of the invention include: provision of completely wireless elevator hallway fixtures; provision of elevator hallway fixtures which receive power without requiring building wiring, and particularly wiring in a hoistway; and hallway fixtures  
5 which require essentially no installation in a building.

This invention is predicated on providing hallway fixtures which are completely wired at the factory within a hallway door frame, including low power communications modules, effective energy storage, and a source of energy which does not require direct connection to building wiring.

10 According to the present invention, an elevator door frame includes the directional lanterns and hall call buttons, together with control, wireless communications and energy storage, along with a mechanism for receiving energy from an elevator car, all completely wired together so that installation of the hall door frame completes the installation of the hallway fixtures. The doorway may also include an elevator position  
15 indicator.

According further to the invention, power for the hall fixtures may be provided by a generator operated in response to motion of the hoistway door; or power may be provided by magnetic coupling with a source on an elevator car; or power may be provided by electrical contacts which become operative when an elevator is at the related  
20 landing.

The invention obviates the need for any wiring whatsoever at the installation site and permits complete installation of the hallway fixtures by merely installing the hall door frame.

Other objects, features and advantages of the present invention will become  
25 more apparent in the light of the following detailed description of exemplary embodiments thereof, as illustrated in the accompanying drawing.

**Brief Description of the Drawings**

Fig. 1 is a front elevation view of a hall door frame having fixtures and employing a door operated generator as a source of power, in accordance with the invention.

5 Fig. 2 is a rear elevation view of the hallway door frame of Fig. 1.

Fig. 3 is a rear elevation view of a slight modification of the hallway door frame of Fig. 1.

Fig. 4 is a partial rear elevation view of a hallway door frame of the invention employing contacts.

10 Fig. 5 is an end elevation view of the door frame of Fig. 4.

Fig. 6 is a partial, partially sectioned, top view of the door frame of Fig. 4.

Fig. 7 is a rear elevation view of a door frame of the invention acquiring power by means of an inductive coupler.

15 Fig. 8 is a front elevation view of an alternative form of hall door frame according to the invention.

**Mode(s) for Carrying Out the Invention**

Referring to Fig. 1, the doorway 13 at a landing 14 of an elevator includes a hoistway door opening 16 defined by a door frame 17. The opening 16 is closed off by  
20 hoistway doors 19, 20 except when a car is servicing the landing 14 (which means stopped and opening the doors). The door frame includes a call module 22 which has one or two hall call buttons, in the conventional fashion such as an up call button 23 and a down call button 24. The call buttons may be illuminated by LEDs, or in some other  
25 suitable way, to indicate that a call has been registered. The door frame 17 also includes a lantern fixture 27 having one or two conventional directional arrows, such as an up directional arrow 28 and a down directional arrow 29 that are selectively illuminated to indicate the direction of elevator travel. The arrows may be illuminated by high-intensity LEDs, or in some other suitable way, to indicate car direction. In the  
30 embodiment of Fig. 1, the fixtures 22, 27 are powered by a generator 32, which is seen more clearly in Fig. 2. The generator 32 is driven by a gear 33 which is coupled to a pinion 34 that is rotated by a rack 35 when the hoistway door 20 is opened upon the occurrence of an elevator servicing passengers at the landing. Assuming a one meter

door motion in two seconds, proper gear ratios can result in a motor speed of around 1800 rpm. A permanent magnet low voltage DC generator can readily provide on the order of 0.014 watt hours (50 joules) of energy which would be sufficient to power typical fixture operation, if low-power radio technology is utilized, for about four hours. This may put an additional force on the door operating mechanism of on the order of 11 pounds (about 5 kilograms). Other generator configurations may, of course, be utilized if desired.

In Fig. 2, the generator 32 is shown connected independently by wires 38, 39 to the lantern fixture 27 and to the call fixture 22. The lantern fixture 27 may have its own electronic module 42 and its own energy storage device, which may be a battery 43 or a super capacitor, all as is known in the art. Similarly, the call fixture 22 may have its own electronic module 46 and energy storage device, such as battery 47. The electronic module 42 may include power monitoring and communication, such as by radio frequency electromagnetic radiation, as well as controlling the application of power to the directional lights 28, 29. The module 46 may include communication capability, monitoring of the power of the battery 47, and control over application of illumination to the up and down hall call buttons 23, 24. The modules 42, 46 may take the form, disclosed in commonly owned, copending patent application PCT/US02/32848, of piconet modules, which may comprise modules conforming to BLUETOOTH specifications, utilized in the manner described in that application. Other electronic modules which can operate with extreme low power consumption and provide adequate control and communication may be utilized, as desired.

Fig. 3 illustrates that the generator 32 may be connected by a wire 50 only to one of the fixtures, such as the lantern fixture 27, the other fixture, such as the hall call fixture 22, being powered by a wire 51 from the lantern fixture. Also, Fig. 3 illustrates that a single electronic module 54 and a single energy storage device 55 may be used to power and control both of the fixtures 22, 27. Or, the electronic module and energy storage could be provided in the call button fixture 22 to power and control both fixtures 22, 27.

In Fig. 4-6, a pair of electric contacts 58 are disposed directly on the inside wall 59 of the door frame 17. The contacts are prewired with a wire 60 to the lantern fixture 42. The elevator car door 63 has a bracket 64 that mounts complementary electrical

contacts 65 powered from the elevator car by a wire 66. Each time that the elevator car door is opened, the contacts 58, 65 are electrically connected, thereby providing power from the wire 66 to the wire 60, resulting in energy being stored in the energy storage device 43, 47, 55 (Figs. 2 and 3).

5           Instead of using a generator or a pair of contacts to receive power from the elevator car when it is servicing a landing, inductive power coupling may be utilized as illustrated in Fig. 7. There are a number of inductive coupling mechanisms available in the prior art, any one of which can be chosen for use as desired. However, it may be preferable to use the efficient inductive coupler 70, having few turns of wire 71 but a  
10       very large ferrite core 72, as is disclosed in a commonly owned copending patent application WO/ (Atty. Docket OT-4942), filed contemporaneously herewith. On the elevator car, an inductive coupler similar to the coupler 70 receives high frequency power from a bridge, which high frequency power is rectified and applied to the storage device within the lantern fixture 27, all in a manner as is known in the art.

15           Fig. 8 illustrates that the hall call fixture 22 and the lantern fixture 27 need not necessarily be disposed within the silhouette of a door frame 17a but could instead extend outwardly therefrom, thereby enabling use of smaller and lighter frame 17a. The fixtures 22, 27 may, however, be integrally formed with the frame 17a and have all of the electronics, energy storage and wiring, as well as the power transfer apparatus which has  
20       been described hereinbefore. Or, the fixtures could be shipped as separate units, with a physically anchoring and electrical-connecting plug-in connection to the frame.

          If sufficient power is provided, either or both of the fixtures could use display devices of various sorts to provide the desired indications.